Photonic Subsystems

Academic Year: (2020 / 2021) **Review date: 10-07-2020**

Department assigned to the subject: Electronic Technology Department

Coordinating teacher: VAZQUEZ GARCIA, MARIA CARMEN

Type: Electives ECTS Credits : 3.0

Year : 1 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Analog and Digital Subsystem Design
Electronic & Photonic Devices

OBJECTIVES

Basic qualifications
-Have demonstrated knowledge and understanding that provides a basis or opportunity for originality in developing and/or applying ideas, often within a research context.
-Can apply their knowledge and understanding, and problem solving abilities in new or unfamiliar environments within broader (or multidisciplinary) context related to their field of study.
-Have the ability to integrate knowledge and handle complexity, and formulate judgments with incomplete or limited information, but that include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgments.
-Have the learning skills to allow them to continue to study in a manner that may be largely self-directed or autonomous.

General qualifications
-Have demonstrated the ability of understanding, making use and integrating of new technologies in electronic systems, to solve new problems or applications.

Specialized qualifications
-Have the ability to design electronic systems at the behavioral level, from a set of certain specifications, whether at system level, using modeling and simulation tools, or at subsystem level, using hardware description languages.
-Have demonstrated knowledge of new analog and power electronics, and photonic components (including those based on new materials and structures) for improving the performance of current applications or systems.
-Have the ability to handle tools, techniques and methodologies for designing advanced electronic systems or subsystems
-Have the ability to design a device, system or application that meets the design objectives and specifications, using a systematic and multidisciplinary approach and integrating modules and advanced tools that are specific to the field of Electronic Engineering.
-Have the ability to solve practical problems related to the block inside or outside interactions in electronic systems; including signal interferences, electromagnetic compatibility and thermal management, at the design and pre-manufacturing stage and also when re-design is required.
-Students should be able to identify the relevant figures of merit and comparison techniques to obtain the best solutions to scientific and technological challenges in the field of Electronic Engineering and its applications.
-Have the ability to apply optimization techniques for the development of electronic circuits and subsystems.
-Have the ability to be effective in looking for information, identifying the state of the art of a technological problem in the field of Electronics System Engineering and integrating this knowledge in future systems.
-Have demonstrated the knowledge of current state of the art and future trends in any of the following areas: power electronics and/or photonics components and subsystems, integrated circuits, integrated optic circuits, microsystems, nanoelectronics, identification and/or disabled people aided systems.

Upon successful completion of this course students will have:
-The ability to design circuits and subsystems able to deal with light including modulation, filtering, multiplexing, switching, amplification and power splitting functionalities.

-Knowledge on basic photonic devices characterization techniques.
-The ability to calculate power and time budgets in fiber optic links acting as electronic subsystem interfaces.
-The ability to use specific tools for both guided optic system as well as Photonic Integrated Circuits design.

DESCRIPTION OF CONTENTS: PROGRAMME

The great advances on optical communication systems due to the always increasing bandwidth demand have been associated to the huge development of photonic component and subsystems. After the fundamentals on light propagation in fiber optics, the different functional blocks of a fiber optic subsystem will be described: amplification, filtering, modulation, multiplexing and switching, as well as their interconnections and interactions. Using these concepts, some simple subsystem will be described as well as the associated technologies and the new trends in different application fields, stressing the competitive advantages of these techniques. The techniques and equipment needed for photonic subsystem characterization will also be described.

LEARNING ACTIVITIES AND METHODOLOGY

Lectures
Exercises
Laboratory work
Tutorials
Team group
Individual reports
Public defense of project work

ASSESSMENT SYSTEM

Ordinary exam:
-Final exam 40%
-exercises and lab reports (team work) 30%
-lectures discussions and questions to other students in project defense 10%
-project work 20%

Extraordinary exam:
Same as ordinary exam or a final exam with 100%

% end-of-term-examination:	40
% of continuous assessment (assigments, laboratory, practicals…):	60

BASIC BIBLIOGRAPHY

- null Fiber Optic Measurement Techniques, Academic Press, 2008

- Ivan Kaminow, Tingye Li, Alan E Willner Optical Fiber Telecommunications Volume VIA: Components and Subsystems, Academic Press, 2013
- Senior, J. M, Optical fiber communications : principles and practice, Prentice Hall, 1992

ADDITIONAL BIBLIOGRAPHY

- Baojin Li, Soo Jin Chua (global) chapter 9: C. Vazquez, P. Contreras, I. Perez, B. Fracasso, B. Vinouze Optical switches: materials and design, Woodhead Publishing Limited, 2010
- J. Cai 100G Transmission Over Transoceanic Distance With High Spectral Efficiency and Large Capacity, IEEE Journal of Lightwave Technology, 2012